Luis Mariano Peñaranda, PhD

Senior Software Engineer – Algorithms, Data Structures, C++

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Education and Positions

2020-2024 Software Engineer at Canonical. Development, mainly in C++17, on the *Multipass* multi-platform virtualization software.
- Led the implementation of big features, such as the first version of network bridging (non-public code), VM command aliases, blueprints redesign, adding network bridges to running instances, mount ownership redesign, and reverse UID and GID mappings. All contributions.
- Worked with backends QEMU, Hyper-V, VirtualBox, LibVirt, Hyperkit.
- Multipass has around 20.000 users across Windows, macOS and Linux.
- Learned Rust in less than two months, to implement future memory-safe features.
- Other technologies: Google Test/Mock/Premock, Python, cloud-init, CI/CD, Flutter, Qt, gRPC, libssh, CMake, vcpkg, git, gcc, clang, vc, gdb, lldb, Valgrind, Docker, Kubernetes (microk8s).

2019–2022 Professor of Computer Science at the Polytechnic Institute, Rosario, Argentina. Taught *Language Theory and Compilers*.

2016–2019 Software Engineer at SciSoft Consulting, Argentina. R&D in C++, C#, JavaScript, Python, applied to 3D design.
- Saved around 2500 dollars/month by implementing a PDF exporter.
- Optimized vision algorithms with OpenCV.
- Conceived novel algorithms and data-structures.

2014–2016 Tenure track professor of Computer Science at the Federal University of Rio de Janeiro (UFRJ), Brazil. Taught *Cryptography*, *Computer Graphics*, *Computational Geometry*, *Numerical Analysis*. Research in Computational Geometry, Computer Graphics.

2014–2015 Consultant in H.Stern jewellery, Rio de Janeiro. Topics include, but are not restricted to, Computer Graphics, Geometric Modelling, Design Processes, Geometric Optimization.
- Applied computer graphics noise techniques to jewel design.
- Optimized design process with computer graphics techniques and software.

2012–2014 Excellence post-doctoral fellow at the National Institute of Pure and Applied Mathematics (IMPA) in Rio de Janeiro, in the Visgraf group headed by Prof. Luiz Velho. R&D in Non-linear Computational Geometry, Computer Vision.
- Implemented Computer Vision algorithms in C++ and OpenGL Shading Language.

2011–2012 Post-doctoral fellow at the National Kapodistrian University of Athens, Greece, in the Laboratory of Geometric & Algebraic Algorithms headed by Prof. Ioannis Emiris.
- Research in Computational Geometry on high-dimensional polyhedra and approximate nearest-neighbors with applications to databases, bioinformatics.
- Implemented in C++ novel high-dimensional and algebraic algorithms.

2006–2010 *PhD* in Computer Science, Nancy University, France. Thesis: *Non-linear Computational Geometry for Planar Algebraic Curves*, adviced by Sylvain Lazard at INRIA Nancy-Grand Est.
- Implemented all the new algorithms in C++ or Maple.
- Patented (in France) an implementation in Maple of an algorithm to compute the topology of plane curves.
- Thesis keywords: algorithms, data structures, computational geometry, non-linear geometry, algebraic curves, topology, isotopy, bit-complexity, implementation, CGAL, algebraic kernel.

1998–2006 *BSc in Computer Science*, University of Rosario, Argentina.
- Averaged 9 out of 10 points in the courses.

1993–1997 *High School*, Polytechnic Institute, Rosario, Argentina.
- Scored 100 points out of 100 in the admission exam.
- Participated in National and some International Mathematical Olympiads.

Software (listed are open source projects; code can be pulled from GitHub, SourceForge, IMPA)

C++17   *Multipass* runs Linux virtual machines Windows, macOS and Linux. It uses different backends (QEMU, Hyper-V, VirtualBox, LibVirt, Hyperkit) to run across all architectures.

C++17   *Paddlefish* is a library to create PDF files. *Empdfer* is a use case of Paddlefish.

C   *Libmug* is a library to compute the greatest common divisor of two univariate polynomials using modular arithmetic to avoid the coefficient explosion in the Euclidean algorithm. The initial code was first published as part of CGAL's algebraic kernel, but later removed and turned into a *just-for-fun* project.

C++   *Respol*: a software to compute a projection of the Newton polytope of the resultant of a polynomial system. Apart of being the implementation of a novel algorithm, this software incorporates improvements in the computation of many sequential determinants, which are crucial to the algorithm, thus considerably speeding-up the computation time.

C++   *HeaDDaCHe*: an implementation of Hashed Dynamic Determinants for use in geometric algorithms, such as Convex Hull and triangulation. This library consists of efficient implementations of dynamic determinant algorithms and a hash table that stores intermediate results in order to be used in subsequent steps of the geometric algorithm.

C++   *CGAL*: the Computational Geometry Algorithms Library is the reference software in Computational Geometry. Code is reviewed by experts before inclusion. I developed modules to deal with curved objects, polynomials and multi-precision floating-point numbers, focusing on performance and robustness of exact computations.

C++, OpenGL   *Panoramic*: a software which uses shaders to visualize panoramic images using different projections. In particular, it permits to use the technique based on Möbius transformations we introduced so far.

Maple   *Isotop*: an implementation of the algorithm for the determination of the topology of real plane curves. This software is registered on the French Program Protection Agency.

Ocaml   *CCTT* tests COBOL source code using the SSA (Single Static Assignment) form as intermediate representation to obtain varibles definition-use chains under different criteria.

Agile Certifications

2014   *Introductory Kanban*. LeanKanban University Certified Training Program.

Language Skills

I am able to fluently speak Spanish (my mother tongue), as well as English, French, Italian and Portuguese. I also have basic communication skills in Greek and German.

Last modification: September 11, 2024